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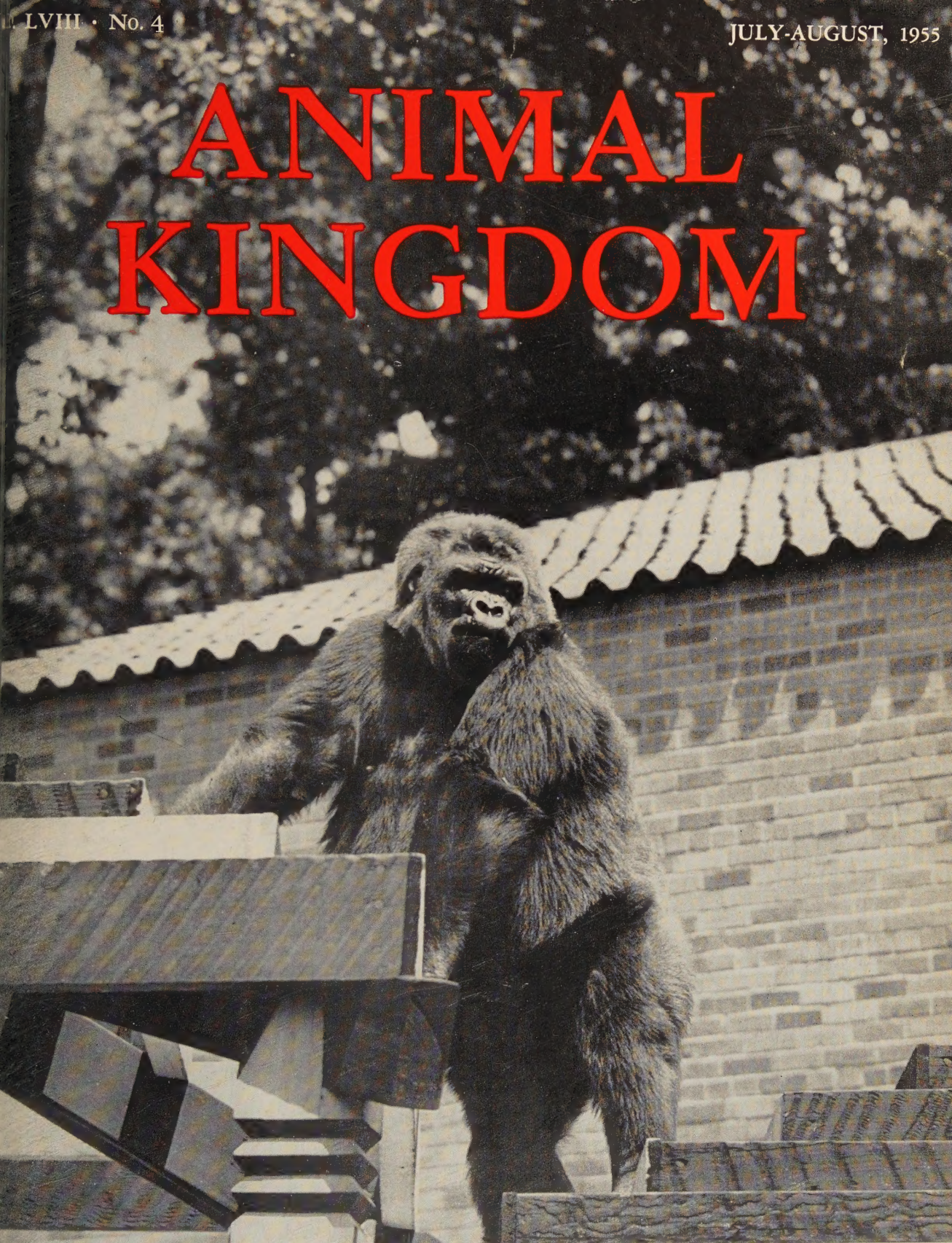
JULY-AUGUST, 1955

ANIMAL KINGDOM



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ANIMAL KINGDOM

Bulletin of the New York Zoological Society

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Jubilee Days at the Zoological Park

THIS IS A TIME OF JUBILATION. Just now we are establishing some new records, each of them, it so happens, connected with animals bearing royal names. Two months ago our King Cobras mated and today there are nine little "princes," the first time in zoological history that the foes of "Rikki-tikki-tavi" have been known to breed in captivity. A few weeks later, our King Penguins mated and at this very moment are incubating a royal egg which, royal or not, we hope will hatch in mid-August. To cap the climax, we now possess two Emperor Penguins, the only ones alive today in any zoo in America, captured last winter in the polar wastes of the Antarctic. In regard to these Emperors, we are deeply sorry for the misfortune of the Washington Zoo through whose kindness we obtained our two birds but whose own Emperors, unhappily, have not survived. At the moment ours appear well and we are hoping for the best as to their continued good health.

Keeping wild animals which come to us from furthest parts of the earth and from regions of varying climates is a delicate business and one that requires unusual skills. The episodes cited above do indeed represent triumphs in the art of zoo management in which the skills of our staff and keepers are intimately involved. After all, our primary duty is the welfare and contentment of our remarkable animal collections. It is because of them that our Zoo has attained its great name.

Fairfield Osborn

NATURE SPREADS A VARIED TABLE

By
William J. Hamilton, J
Professor of Zoology, Cornell Unive

IT IS RECORDED in the publications of the New York Zoological Society that approximately 150 kinds of food are more or less regularly on the menu served to the Zoo's wild animal collection. The figure is impressive, and bespeaks an admirable concern for finicky tastes. But it pales to insignificance in comparison with the variety of foods that animals choose to eat in the wild – or are forced to eat.

The fact is that the food of wild animals is usually dictated by availability. Most species have a catholic taste and eat that which is most abundant. Our Red Fox, with a formidable dentition presumably modified for a carnivorous fare, utilizes the seasonable foods at will. While mice and rabbits sustain the fox during the cold season, the blades of winter wheat, pushing above the shallow snow, may stay its hunger when more favored delicacies are not to be had. Strawberries, blueberries and other fruits are utilized in the summer months. Most of our native mice, whose teeth might well stamp them as vegetarians, are highly insectivorous; meat may occasionally account for a large share of the food. The Myrtle Warbler, like others of its kin, has a rather weak bill modified for a diet of insects. More hardy than others of the warbler family, it often winters in our northern states, subsisting on the hard-shelled bayberries and dried fruits that sustain it when insects have disappeared. It is impossible to ascertain the probable diet of many common species merely by an examination of the teeth, the bill or mouth parts, used in food getting.

Many animals exhibit an ecological plasticity, adapting their diet to other items when a favored food is absent. Few vegetarians illustrate this better than our Red Squirrel. On the Cornell

University campus, the large elms provide an abundance of swelling buds in the early spring, and these are eagerly consumed by the squirrels. The sprouting samaras of the past year are dug from beneath the maples. The flowers of many trees are eaten as they open. Twig cutting commences as the blossoms go to seed; the ground below will often be covered with the terminal tips of limbs, only a few blossoms or seeds of which have been removed. This lavish feeding is notable, not only with the squirrel, but with many other species as well. This behavior has a real significance. For whatever the crop the squirrels enjoy at a given time, be it acorns, seeds or buds, is at that time far in excess of their needs. It behooves the squirrel not so much to conserve its food but rather to cultivate a varied appetite and wide knowledge of what is good to eat and where to find it, so that failure of any food source at any particular time of the year or in any particular year will not find it at a loss as to where else to turn for sustenance. The oft-repeated statement that tree squirrels are dependent upon the mast crop, and decline in numbers when the nut crop fails, is without foundation. For these adaptable creatures have a truly varied diet, and manage well in spite of a short crop of a favored food.

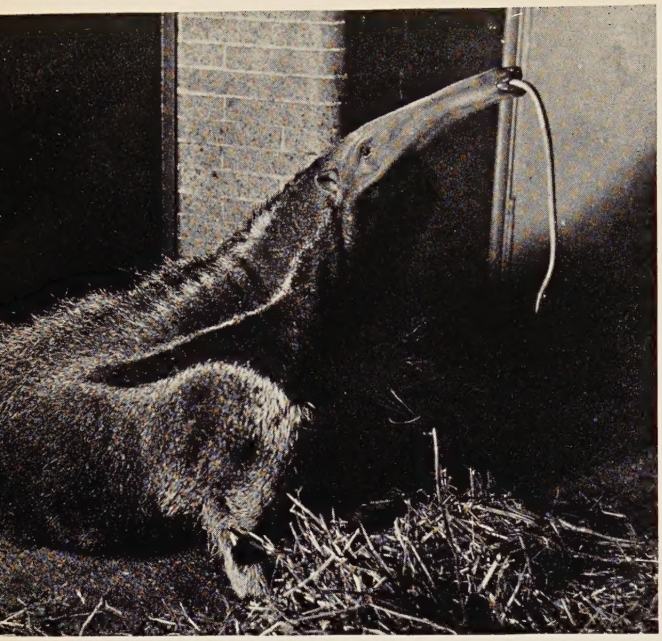
Relatively a few animals are monophagous. Any herbivore, narrowly specialized in its dietary, must necessarily be restricted in its distribution to that of its specific food plant. A catastrophic disease, eliminating the principal diet, would necessarily spell doom to the dependent feeder. Specialized forms cannot adapt themselves in a quickly changing world. If some insect, plant disease or other agent should eliminate a plant which alone serves some animal, the creature would pass with it. Fortunately no such strait faces the cecropia, eucalyptus and other food plants of which I am aware. Our American elms, now seriously threatened with phloem disease and attacks by the Dutch elm beetle, fortunately do not provide the major sustenance for a single vertebrate species. The Baltimore Oriole, utilizing the long drooping branches for its nest, may become less common if our elms should disappear; it could probably adapt itself in time to less favored trees.

The Koala, almost the trademark of Australia, has probably been publicized as much as any mammal. It and the kangaroo are synonymous with the continent down under. But while kangaroos are standard exhibits in any large zoological park, very few Koalas have been seen alive outside their native land – chiefly because of their highly specialized diet. In the wild state, the Koala feeds only on the leaves of the eucalyptus. So specific is this diet that trees of the same species are favored over others. The effect of soil and probably the nutritional content of the leaves on the Koala's choice has been pointed out by Burnet.[1] The shoots and leaf tips of some gum trees may actually give off a volatile poison (prussic acid) in toxic quantities. Few animals are so bound to a specialized food in restricted localities as the Koala. The Australian zoologist, Troughton,[2] indicates that here is a creature whose drastic shrinkage in numbers may be attributed, in no small measure, to the clearing of certain favorable food trees.

Our American tropics provide some interesting specialists. The great bushy-tailed anteater, lacking teeth, must utilize its long, viscid tongue to probe the ant hills and termite tunnels for a diet of these creatures. Its powerful fore claws, ripping apart the tortuous tunnels and cavities that harbor these delicacies, make way for a gluttonous repast. Enders[3] remarks on the way the tongue is employed by the three-toed anteater. He states that this organ is capable of following a tunnel to its end, then passing over to a parallel tunnel; the tongue tip may clear the cavity by moving in a direction opposite from its base.

Yet another of our tropical mammals leads a restricted life in several respects. The Three-toed Sloth feeds solely on the leaves and buds of the cecropia. Lacking this primary favorite, the creature will eat leaves of the hog plum tree, *Spondias*. It is said that the mother weans her young on the predigested leaves of the cecropia. The Giant Panda of southeastern Asia, a relative of our raccoon, subsists almost exclusively on bamboo shoots. But even the specialized feeders may become adjusted to a zoo diet of substitutes if the change be made gradually.

Our own American Tree Mouse (*Phenacomys longicauda*) lives among the evergreen forests of the Pacific Coast. According to Howell,[4] the normal food consists solely of the fleshy part of



The Giant Anteater of the American tropics uses its long, viscid tongue to probe ant hills and termite tunnels and extract its food. It has no teeth.

the needles and the bark from the tenderest growth of the fir twigs. A terminal twig, preferably of Douglas fir, is severed, each needle removed and the medullary part eaten, while the sides and resin ducts are discarded. The uneaten portions are either dropped to the ground or added to the large tree nests. Captive mice may eat freely of many substances, but if deprived of these needles they soon languish and die.

The Florida swamps and waterways nurture two specific avian feeders. The food of both the Everglades Kite and the Limpkin are largely restricted to the snail, *Ampullaria*. Colonies of the kite, or Snail Hawk, are necessarily restricted to the haunts of this molluscan. The unbroken shells are discarded beneath the bushes in the regions where this bird is numerous, and give indubitable proof of its presence. The Limpkin, probing the mud for the embedded snails, snatches the creature from its retreat, twitches off the operculum and deftly extracts the body from its hard covering. These birds do not appear modified for a specialized diet. Indeed, the Roseate Spoonbill, another Florida citizen, with its peculiar spatulate bill, appears far more specialized, yet its diet is not restrictive. Moving the partially opened bill to and fro through the shallow water and soft mud, these handsome birds secure small minnows, aquatic insects and shellfish.

So far as is known, all snakes are animal feeders, although Barbour[5] suggests that the narrow-mouth fossorial species of the Typhlopidae may eat caterpillar dung. While snakes may utilize the vegetable contents of their prey, it is a rare instance when one feeds directly on plant food. Some species are rather restricted in their diet, including in their fare a relatively few items. The little black-headed snakes, *Tantilla*, feed primarily on centipedes; a large series which I have examined from Georgia had eaten these invertebrates alone. The common Red-bellied and DeKay's Snake of our northeastern states utilize slugs in high degree. Perhaps the most specialized of all are the egg-eating snakes of Africa.

Bamboo shoots, leaves and twigs i favored by the Giant Panda in wild, but in the Zoo it can be indu to take some supplementary foo

A two-foot individual can swallow a hen's egg. The young of these snakes are not so specialized, for their teeth, unlike the adults, are adapted for grasping less passive food. It is well that the youngsters are so adapted, for there is a limit to the size of eggs they can swallow during their infancy.

Lizards are for the most part carnivorous or insectivorous, although this group provides a few notable exceptions. The Marine Iguanas of the Galapagos Islands are social-minded creatures, hundreds gathering on the rocky shores and entering the water to feed on the seaweed. These islands support another large lizard, which Darwin observed feeding on succulent cactus and the leaves of various trees. Our own Chuckawalla, a large lizard of the southwestern desert, presumably feeds entirely on plant matter, utilizing tender leaves, flowers and fruit.

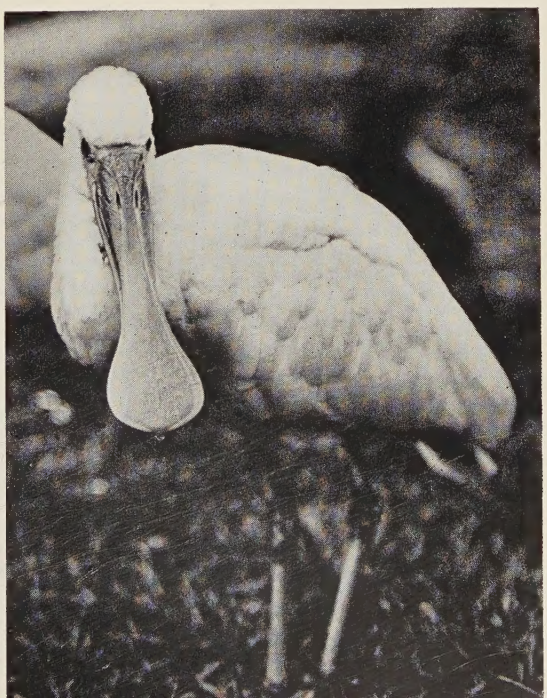
Frogs and toads are largely dependent upon water, most species utilizing the ponds and slow streams for breeding activities in the spring. The aquatic larvae are as diverse in their feeding habits as in the form of their bodies. Transformation to the adult, with attendant modification

of the mouth and the alimentary tract, provide an immediate change to an animal diet. Dependent upon size, these tailless amphibians seek their own niche but few become specialized feeders. The little narrow-mouthed toad favors the ant billions that occur in its realm. Night collecting in southern Florida often reveals this little fellow, its snout poked in an ant tunnel, intent on a formicine feast.

Our larger frogs disdain such minute food; they are as adept and versatile in feeding pattern as other vertebrates. Any creature of a size that will satisfy the all-embracing appetite is a probable meal. Some, with cannibilistic traits, wait on the shore line to grab the helpless transforming young. Nor do they spurn the rats, birds and other prey that happen to alight within reach of the huge jaws. Our southern states spawn the mottled Gopher Frog, a rarity to most collectors except during the spawning chorus. This fellow, with giant gape, downs any hapless relative who ventures near his chosen burrow. Most diminutive of all frogs – perhaps the world's smallest, the diminutive *Hyla ocularis* of our southeast – is content with the small insects which venture in range of its viscid tongue.

Our native Opossum is no epicure, feeding on a wide variety of fruits and flesh. But its distant cousin, the tiny Australian Honey Possum, so small that it can snuggle in an average-sized pill box, is far more particular about its food. In these diminutive creatures, the snout is lengthened into a long narrow proboscis for thrusting into blossoms, while small flanges on the lips overlap to form a channel through which the beast sucks up pollen, nectar and tiny soft-bodied insects. The feeding is aided by a slender tongue, equipped with bristles, that can be extruded well beyond the snout. This structure acts as an excellent brush to sweep up the sticky food. In such a specialized feeder, we usually find a corresponding degeneracy in the teeth, which eventually become designed only for masticating fruit pulp, honey and soft animal matter.

A similar situation prevails in some species of bats. These little flying mammals are primarily insectivorous yet in the tropical areas of the world specialized feeders are not uncommon. Choeronycteris of our own tropics delights in large blossoms, reaching the base of the flower with its long tongue or licking out soft juices and the pulp of fruits. It is admirably adapted for



The Roseate Spoonbill would seem to be restricted in diet by the peculiar shape of its bill, but actually it can pick up many kinds of food with ease.

such a diet. Like the Honey Possum, its snout is long and narrow and the long extensile tongue has a little brush at its tip. A further modification of this flower feeder is found in the absence, at least in some species, of the lower incisor teeth, facilitating free play of the tongue. Some of these bats undoubtedly play a part in the cross-pollination of night-blooming plants.

Thus one finds a counterpart with some of the nectar feeding birds, notably the Hawaiian honeycreepers. The brush-tipped tongue of Drepanis serves the same function as in Choeronycteris, probing the tubed flowers of lobelias. Our hummingbirds are another group which utilizes the nectar and the tiny insects which in turn are attracted to this sweet food.

One of the most remarkable feeding traits of all is found in the sand shark, *Carcharias taurus*. Stewart Springer[6] found that great numbers of eggs, up to 24,000, are produced by a large female. In spite of this huge production, only two embryos develop. As they reach maximum size, one to each oviduct, the young become active and commence to feed before they are expelled into the sea. The undeveloped eggs are eaten while the embryo is still within the oviduct. Here is a species that sends forth into the world not only well-developed large young, but babies with a full stomach. Springer surmises that birth may proceed as a direct result of a hunger drive on the part of the embryo, which causes it to reverse its direction when egg production falls below a satisfactory level.

Some animals rely upon other species to harvest their food. The Lucifer Hummingbird, a rare visitant to our southwest, feeds at flowers like our Ruby-throat, but it also visits the larger spider webs to remove the small insects which have been snared. These feathered sprites must exercise care for they, too, might be trapped by the predacious spiders.

The Remora, equipped with a modified dorsal fin that provides a convenient suctorial disk on its head, attaches itself to a shark. When the host makes a kill, the Remora leaves its benefactor in order to feed at the same table. Particles too small for the shark are utilized by the shark sucker.

Many quaint stories are credited to the Greek historian, Herodotus. Among others, he mentions a species of plover (probably the Black-billed Courser), slipping into the gaping jaws of the Nile Crocodile to pick off leeches which infest the gums of these huge reptiles. At the same time, the birds glean bits of food from the teeth. Perhaps this story has a basis of fact, for the birds do sit on the basking "crocs." Since these reptiles, while resting, often lie with the jaws parted, it is not beyond reason to suspect that the birds utilize the scraps found in the gums of the crocodile. To be sure, the plover would not be dependent on this source alone for its sustenance.

Few feeding habits are more bizarre than the twice-fold eating of a meal. Wolves will often gulp such a quantity that they must vomit the stomach contents, to eat more leisurely the previously ingested food. This is not so with rabbits. Some species, as the European rabbits, ingest the feces. Southern[7] watched wild rabbits eat the droppings as they were extruded. Possibly this phenomenon is associated with severe winter weather, when perhaps the animal must perforce

utilize the digested food again. Crowcroft[8] found this same situation to prevail in the shrew, *Sorex araneus*. The rectum is everted, the contents eaten and the structure inverted to its normal position. Possibly, as Bourlière[9] suggests, this habit provides the creature with large amounts of vitamin B produced by bacteria in the food within the large intestine.

How little we yet know of the feeding habits of our common animals and how much is to be learned! This habit of "refection" or coprophagy, as it is termed, is common to the domestic rabbit, possibly to many other mammals.

No less interesting than the food itself is the manner of securing it. Lures are employed by many species to entice the unsuspecting prey within range of the jaws.

The fabled Angler or Goosefish, a bottom feeder of the North Atlantic, employs a curious device to snare smaller fish into its capacious maw. The modified first dorsal spine has worm-like tentacles on its tip and arises from the snout, far forward from the usual position of most fish. Normally it lies against the back. When a small fish approaches, the "rod" is moved forward, the lure is activated and the unsuspecting prey, swimming ever closer, is swept into the mouth. Occasionally forsaking the rubble bottom, a large Angler will surface to snare an unwary gull or sea fowl.

The muddy lagoons of the Mississippi harbor our largest fresh water turtle, the giant Alligator Snapper. Individuals attain a weight of 200 pounds; the tremendous head may measure eight inches across. Less active than its smaller cousin, the common Snapping Turtle, this great reptile has devised a unique manner to attract smaller creatures within range. The tongue supports a peculiar distensible growth, somewhat wormlike in appearance, that stands out in relief from the dark tissues of the mouth. Those which I have observed were dull gray in color. When fishing, the mouth is open, the bifurcated lure is wiggled slowly and the turtle patiently waits for a meal. Hidden in the detritus of the bottom, its carapace often camouflaged with a mat of algae, the reptile is not easily recognizable, and thus the bait ultimately attracts a fish. One nibble at this prospective meal, and the victim itself is dispatched by this living trap.

Prey-attracting lures that are part of the predator's body, as in the various angler fishes, are a curious adaptation to food-getting. Here a small fish is approaching the extended, worm-like tentacles.

I have long been intrigued by the manner in which the Red Squirrel carries various fungi to the trees, placing them in a forked branch for curing, later returning to replete itself on the stored food. I urge the reader not to accept Walton's account in his otherwise delightful story, "A Hermit's Wild Friends." He declares that only those fungi stored by the squirrel are fit for human consumption, and followed the dictates of choice laid down by this little red fellow. Unfortunately, the cache is often made up of Amanitas which contain an alkaloid poison virulent to man. One writer remarks that the fly amanita was responsible for the death of Czar Alexis of Russia, yet the squirrel utilizes it as a food. *Russula* is another fungus that is consumed by the squirrel, but human beings must beware of this deadly genus. Bourlière includes *Russula* in the dietary of the Roe Deer. He credits Hediger[10] with the observation that exotic ruminants often poison themselves by eating *Solanum nigrum* (a poisonous plant common in our own country) that native Chamois and Ibex instinctively avoid.

From this summary account of some animal diets, one thing stands out: Nature may not always provide a bountiful table for all her children, but she does offer almost infinite variety.

[1] Burnet, Noel – quoted by Ellis Troughton, p. 134 of "Furred Animals of Australia," 1947.
[2] Troughton, Ellis – as in footnote 1.
[3] Enders, Robert. 1935, Mammalian Life Histories from Barro Colorado Island, Panama. Bull. Mus. Comparative Zool., Harvard College, vol. 78 (4): 494.
[4] Howell, A. B. 1926, Voles of the genus *Phenacomys*. North American Fauna, 48. Washington.
[5] Barbour, Thomas. 1926, "Reptiles and Amphibians." Houghton-Mifflin, p. 40.
[6] Springer, Stewart. 1948, Oviphagous embryos of the sand shark, *Carcharias taurus*. Copeia, No. 3, Sept., pp. 153-157.
[7] Southern, H. N. 1940, Coprophagy in the wild rabbit. Nature, vol. 145, p. 262.
[8] Crowcroft, Peter. 1952, Refection in the common shrew. Nature, vol. 170, p. 672.
[9] Bourlière, François. 1954, "The natural history of mammals." Alfred Knopf, p. 41.
[10] Hediger, H. 1950. "Wild animals in captivity." London, Butterworths. 207 pp.

The Black Howlers of Barro Colorado

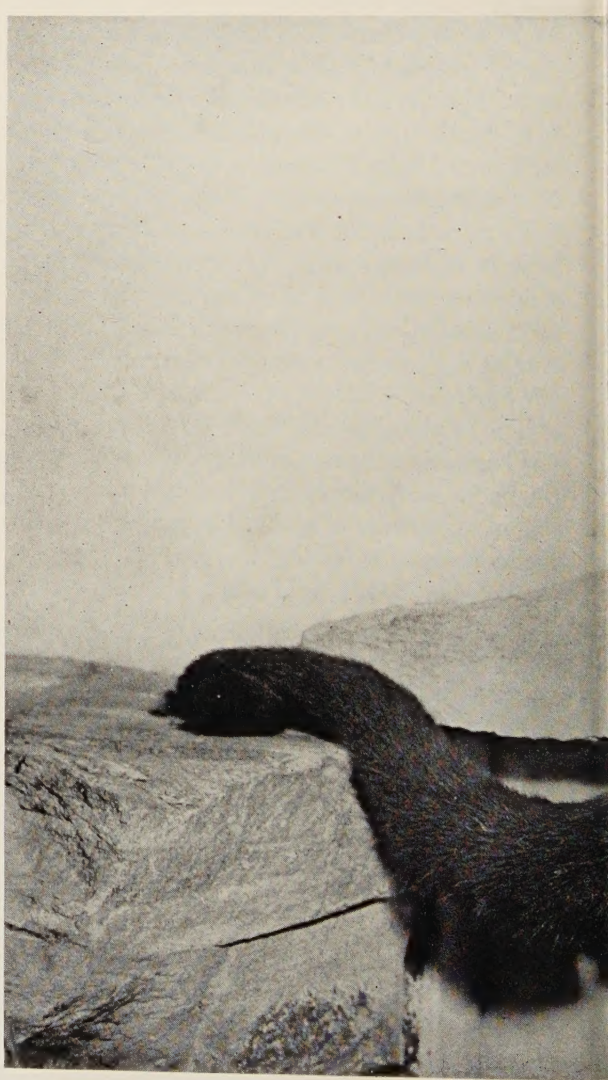
By CHARLES H. SOUTHWICK

Department of Zoology, Ohio University

I SHALL NEVER FORGET my first morning's experience with the Black Howler. I had arrived on Barro Colorado Island, in the Panama Canal Zone, on a warm evening in early March. Dr. Nicholas Collias and I arose at 4:30 o'clock the following morning, and an hour later we were half a mile from camp waiting in the dark quiet of the predawn tropics. Our breathing, after we had climbed numerous hills and pitched into uncounted ravines, was the noisiest sound to be heard. By 5:45 o'clock the blackness was diluting and we were able to make out nearby tree trunks draped with woody vines. Off in distant ravines, a Great Rufous Motmot hooted several times, with slow and hollow tones. The shrill wavering whistle of a tinamou came from an undeterminable distance. Then the air was torn and our ears were buffeted by the roar of the howler monkey. I had read about it, I had imagined it, I had even heard it recorded, but none of this had prepared me for hearing the howler's call in the wild.

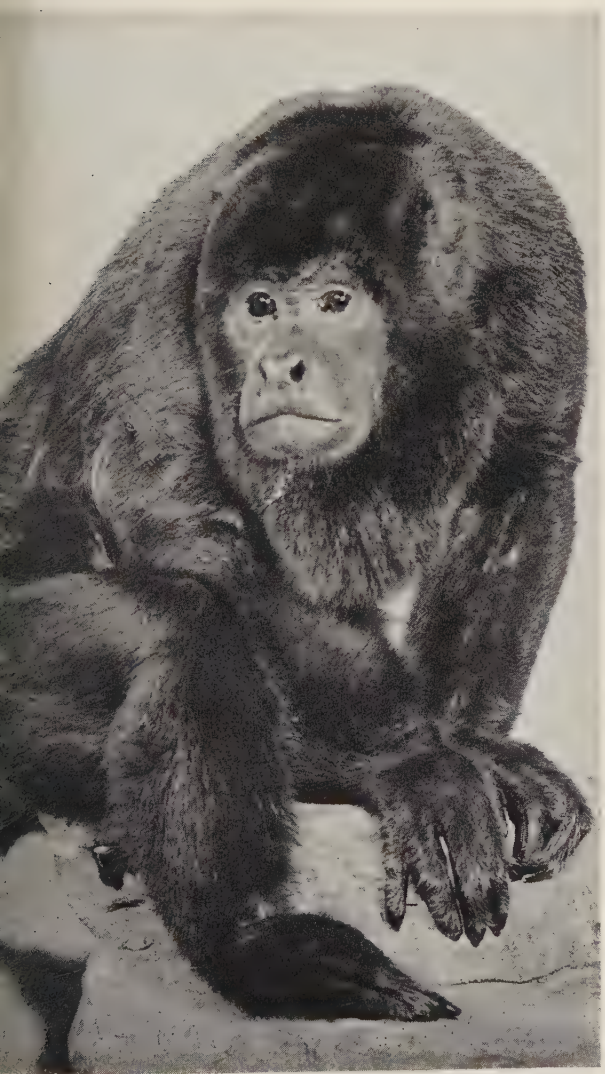
As the first male of the morning began his howling almost directly over us, other males, some distance away, answered his vocal challenge. The howling filled the air, then ceased, then began 400 yards away, was answered, and resounded from male to male until we had distinguished half a dozen individuals entering into the chorus. Occasionally the sharp, terrier-like whine and bark of the female could be heard. By 6:30 o'clock daylight had come, and all was quiet. The hooting of the motmot ceased, the whistle of the tinamou was heard no more, and the monkeys settled down to their day of sleeping, moving and eating.

HOWLING (or howler) monkeys have been called the most impressive of the American primates. Certainly they are the largest New



World monkeys and adult males attain a weight of as much as 26 pounds, with the scarcely smaller female averaging 15 to 18 pounds. But these statistics are weak when one has seen howlers in the wild. There, for some reason, they appeared — to me, at least — to be much larger than their recorded weights would indicate. Perhaps my sense of size was distorted by the grandiose proportions of the tropical forest.

Howlers range from the jungles of Guatemala and Vera Cruz to the southern limits of Brazil and there are two species and a number of forms; the Black Howler (*Alouatta palliata*) is most common in the northern part of the range, while the Red Howler (*Alouatta seniculus*) becomes abundant in the valleys of the Orinoco and the Amazon. Neither the Black nor the Red is likely to be very familiar to the zoo-going public, for howlers are extremely difficult to keep in captivity — it is, apparently, a matter of most individuals not being able to adjust from a fruit-and-leaf diet in the wild to the more restricted diet in the zoo. Nevertheless, the New York Zoological Park did quite well with a Mantled Howler Monkey from Ecuador (*Alouatta palliata aequatorialis*) which was received on July 20, 1950, and lived until May 18, 1954. It had, however, been captured as a very small baby and had been hand-reared and "fussed over" as far as diet was concerned.



This is "Ugly," a Mantled Howler Monkey from Ecuador, which came to the Bronx Zoo as an infant and readily adjusted to a diet much different from its leafy food in the wild.

The great naturalists of South America — Humboldt, Rengger, Wallace, Darwin, Bates, Belt, Beebe, Barbour, Chapman and others — have all written interesting accounts of howling monkeys. W. H. Hudson introduced the howler to the literary world in his romance of the Venezuelan forest, "Green Mansions." More than twenty years ago Dr. C. Ray Carpenter studied the howler's individual and group behavior and in 1934 published, in *Comparative Psychology Monographs,* what is considered one of the great works on primate ecology.

But the howler's popular fame rests on his magnificent voice, a voice which has few rivals in the animal world. The males greet the dawn with a tremendous vocalization which resounds for a remarkable distance. Many writers report hearing it two or three miles away, although it is doubtful if it carries more than a half to three-quarters of a mile through dense forest. The sound is produced by resonating air forced into an unusually large and hollow hyoid bone in the throat, and is out of all proportion to the size of the animal. It is deep, penetrating and fierce.

The howling we had heard on our first morning on Barro Colorado was a declaration of territorial rights. The males directly above us were accompanied by females and juveniles. They were a family group, which may have been composed of any number from four to thirty-five individuals. They moved together, fed together,

lodged together and ranged over a definite territory. There were many other similar family groups, or clans, of howlers on the island, and the distant answers we had heard came from the males of other clans. Each clan proclaimed its position and its territory.

The size of a clan's territory varied with many things; the number of males in the clan, the availability of food, the number and the pressure of neighboring groups. On Barro Colorado, an island of six square miles, there were approximately twenty-eight clans, each occupying an area a fourth to half a mile in diameter. The territories overlapped somewhat, for while a clan was on one side of its territory, a neighboring clan might make inroads on the opposite side. But when two clans approached each other closely, as in nearby trees, a deafening howling battle would take place, and the males would roar viciously at their opponents for an hour or more. Direct combat rarely occurred, for such vocal battles apparently provided a satisfactory substitute, and the rival clans would retreat into their own territories.

The typical day of a howling monkey clan began with the morning howling, followed by two or three hours of resting in the lodge trees where the group had spent the night. The lodge trees were any large trees which provided a labyrinth of branches for the monkeys to recline on. Certain trees, such as the fig, almendro, carquera, sandbox or cedro espinosa were definitely favored, and there seemed to be preferences for trees with scant foliage. Partially or totally denuded trees were always present in the jungle, since many tropical trees seem to follow individual patterns of losing and regaining their leaves.

The monkeys would begin to move at any time in the morning. First one or two individuals would move into neighboring trees and others would follow. The progression was usually in single file, led by an adult of either sex. Normally the progression would be 200 to 400 yards toward some food tree of choice. A ripe fig tree represented a point of considerable attraction, not only for monkeys, but for parrots, coatis and even deer and peccaries, who would feed on the dropping figs. Usually, however, the howlers occupied a tree by themselves, and were rarely bothered by other animals. The more mobile White-faced Sapajou often sped through the trees near howler clans, but usually at lower levels, so that the two monkeys had little contact. The howlers fed on the fruits, leaves and stems of

food trees, while the sapajous preferred only the fruits – another difference between the species which minimized competition. The leaves of the camito, espave, almendro, berbe, mangabe, carquera and wild nutmeg were also choice foods for the howler. They were apparently surrounded by an inexhaustible store of excellent foods, except in the driest of years when leaves might turn brown by the end of the dry season in March and April.

After an hour or two of feeding, the monkeys would generally settle themselves into position for a mid-day rest of several hours. While the adults dozed, the infants or juveniles often played and provided most amusing shows. Two one-year old infants might stray a few feet from their resting mothers and engage in tag. They would clamber among the branches as a small boy climbs among monkey bars during a mid-morning school recess. Or they would dangle by their indispensible tails and have a good game of fisticuffs. If they were unaware of an observer, their play was spontaneous and delightful to watch. It might continue for an hour or two, the youngsters seeming never to tire of their simple games and explorations.

Sometime in mid- or late afternoon, the howlers would begin a slow progression out of their food trees toward the evening's lodge trees. This single file progression would again be one of several hundred yards. In passing from tree to tree each monkey usually went over the same branches and made the same bridge between trees, day after day. If the bridge was a precarious one requiring a stretch of several feet, one of the adults might form a bridge with its body to enable a juvenile to cross. Howlers are cautious climbers and almost always maintained contact with at least one hand, one foot, or the tail. This was quite in contrast with the fast moving White-faced Sapajous or Capuchin Monkeys, which would hurl themselves recklessly twenty or thirty feet into space when jumping from one tree to another or crossing a ravine. The sapajous were complete masters of their medium, whereas the howlers generally moved with considerable deliberation as if not quite trusting the trees in which their lives were passed.

By 6:00 or 6:30 o'clock, as the sun was setting, the howlers would be located in their lodge trees. They moved out along the branches and each found a spot of preference to spend the night.

An infant howler has just completed a difficult crossing by using its mother's tail and body as a bridge. Howlers generally use the same branches and make the same bridges in travelling.
(Photograph by C. R. Carpenter)

This little howler fell out of a tree and was attacked by the male of the clan. Such attacks by adult males on infant males may explain why comparatively few young males were found.
(Photograph by the author)

The sneering youngster on the left is a year-old male howler reared in captivity with a Red Spider Monkey of the same age. Spider Monkeys live in Panama but not Barro Colorado.
(Photograph by C. R. Carpenter)

They usually lodged high in the tallest trees and were sixty to a hundred feet above the ground.

When Dr. Carpenter studied the howlers on Barro Colorado in the early 1930s, he found the average clan to be composed of seventeen individuals, with wide variation, of course. The typical group had three adult males, seven adult females, four independent juveniles and three infants dependent upon their mothers. The young howler requires nearly three years to mature. In the first month after birth, the infant is only seven or eight inches long, excluding the tail, and his fur is light gray. He clings closely to his mother's abdomen and breast and never leaves this sheltered spot, even while she moves and feeds. By the time he is two to eight months old, he often rides on his mother's back. He is larger now, and has assumed a brownish-black color. At about one year of age, the infant still remains in close contact with the mother and rides on her back during a group progression, but in the midday siesta periods he may wander a few feet from her, exploring the nearby branches and beginning elementary games of play with other infants of his own age. Throughout his second year he becomes more independent, playing more vigorously, wandering further from his mother, and trying out the palatability of leaves and fruits for himself. When the group moves, however, he sometimes clings to the back of his mother. In the young howler's third year, he becomes an independent individual within the group. Moving, feeding and lodging by himself, he is no longer dependent upon his mother. He is nearly the size of an adult female, but a sufficient difference exists to distinguish him as a subadult. At the end of the third year and beginning of the fourth, the juvenile attains sexual maturity and develops a white, visible scrotum if a male, or becomes capable of bearing young if a female.

One wonders what happens to the young males to produce the marked abundance of adult females over adult males. Carpenter saw a male with fresh wounds and observed conflict between other adult males. Elias Uriola, an experienced hunter and one of our field guides, told us that adult males may attack and kill young males.

Dr. Collias and I obtained no direct evidence of this, but it is probable that some behavioral trait alters the adult sex ratio.

In 1933, Carpenter found 489 howling monkeys on Barro Colorado and they were grouped into twenty-eight clans. In 1951, we found only 237 howlers on the island. Our efforts at finding and studying the monkeys were made possible by the keen naturalist's ability of Sylvestri Aviles, who had been Carpenter's guide. Although the number of monkeys present in 1951 was less than one-half the number of 1933, the number of clans was about the same. We located twenty-nine clans, many of them occupying the same territory that they did twenty years earlier. The average clan size was now much smaller, however, being composed on the average of only one adult male, four adult females, one juvenile and one infant. If the average monkey lives nine or ten years, it is clear that the integrity of a clan is passed on for several generations and the same territorial area is traditionally maintained.

It is of great interest to biologists to discover what controls a natural, undisturbed population of animals living on an island. Does not reproduction increase population size beyond tolerable limits in such a confined population?

In the howling monkey, an obvious trait influencing population size is the intolerance between clans, although its actual mechanism is somewhat obscure. Each clan maintained an area of its own, and other clans approaching too close were strongly repulsed. Such a characteristic of intergroup intolerance might force certain clans into submarginal habitat where existence would be precarious. The howler is much like the Bob-white Quail — a strong cohesion within the clan or covey maintains the group, but intolerance between groups limits the number of animals on an area and prevents over-exploitation of the sources of living. The howler and the Bob-white prefer to live with elbow room.

Such intergroup intolerance might help to explain the presence of the same number of groups now as compared with twenty years ago, but it could not explain the reduction in group size by nearly one-half. Such a phenomenon as reproductive failure, predation or disease might seem the more likely cause of a reduction in clan size.

In the Barro Colorado population, casual evidence suggested that the reduction in numbers had been of recent and rather sudden occurrence. This indicated a mortality factor rather than a change in reproductive rates.

None of the students of howling monkeys has found evidence of extensive predation. The howlers are largely unharried by predators on a sanctuary such as Barro Colorado. On the mainland of Panama they are hunted by natives, but hunting was prohibited on the island. Other natural predators such as Cougars and Tayras are present on the island, but no evidence indicates that they can capture a howler except on rare occasions. In one instance, an Ocelot has been known to capture a young monkey. Harpy Eagles are present in Panama but are of little significance in the life of the howler. By and large the howler is king of his habitat, and suffers no depredation at the hands of a vertebrate predator.

Disease and parasitism, however, represent more probable mortality factors. Occasionally an individual showed obvious signs of sickness, with slow and sluggish movements, poor appetite and failure to exhibit normal reactions to other monkeys. Howlers are frequently parasitized by botfly larvae which produce swellings about the head, neck and chest. Pathological studies on howlers collected in various areas of Panama have shown parasitic infestation of the liver, and grossly enlarged spleens with deep scars, indicative of infectious disease.

Many studies have centered around the relationships of yellow fever to various species of monkeys. Several investigators have found evidence suggesting that epidemics of jungle yellow fever have occurred among monkey populations in Brazil, killing large numbers of howlers. Thus, there are many indications that natural populations of howling monkeys are decimated by disease.

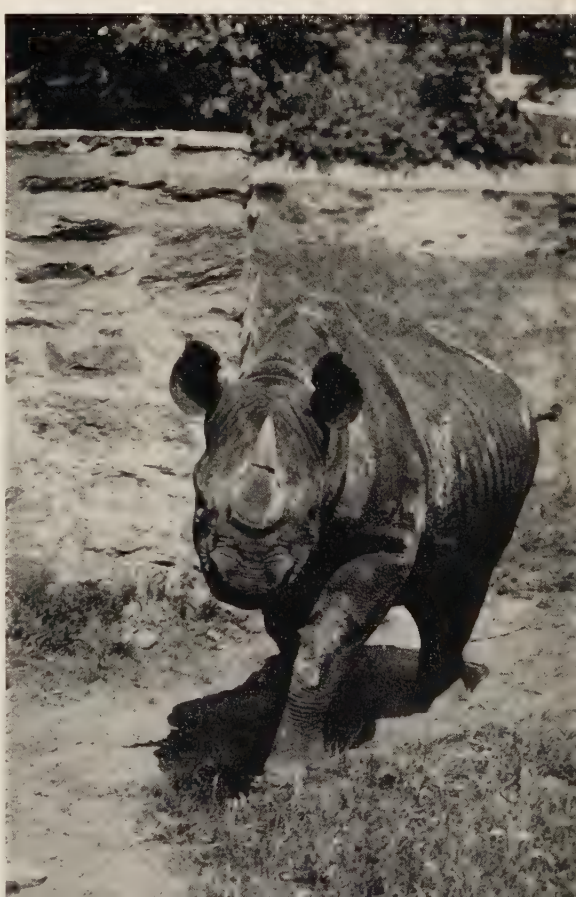
One cannot visit a tropical research station like Barro Colorado without feeling gratitude toward those who foster and protect such magnificent areas throughout the world. Barro Colorado lies in Gatun lake, and the entire commerce of the Panama Canal passes within 200 yards of its shores. Yet, despite this proximity to world trade, the island remains a gem of tropical America, and the Black Howling Monkey rules as a magnificent member of its fauna.

MID-SUMMER IN THE ZOO

Photographs by SAM DUNTON

KOMODO MONITORS, or **"DRAGON" LIZARDS** are not prehistoric monsters unaccountably surviving in a remote part of the world (as some of our visitors have been heard explaining to their children), but, simply, the largest of present-day lizards. Our two specimens of *Varanus komodoensis* arrived on May 22 by air, only five days after they left the Surabaja Zoo in Java, where they had been kept for four years. They are a pair; the male weighed 218 pounds on arrival and is 8 feet 9 inches long; the female weighed 109 pounds and is 8 feet 4 inches in length. A little more than 10 feet seems to be maximum length for the species, which is found only on four small islands (including Komodo) in Indonesia. For the first few days our monitors were lethargic and sleepy – not unlike human beings after a similar tiresome journey. They are now so active that when a keeper enters their compartment for any purpose, another has to fend off the male with a wooden shield. Our best information was that adult monitors could not, or did not, climb. Consequently no steps were taken to screen the concrete flower box along the wall at the rear of their compartment in the Reptile House. To our dismay, the male reared slightly on his hind legs, hooked his front claws over the lip of the box (46 inches above the floor) and hoisted himself into the plants. Fearing he might injure himself when he half-slid, half-fell to the floor, we have boarded up the ledge. At first, the monitors readily took strips of horsemeat, but later refused it. Well-ripened pork is now their favorite food, although they also accept squabs (but not pigeons) and hen's eggs. They are entirely carnivorous, and are certainly deliberate feeders, sniffing their food, circling it, going away and coming back between each chunk of meat they swallow.

A "timid rhinoceros" is virtually a contradiction in terms. It nevertheless describes Little Joe, the new **AFRICAN BLACK RHINOCEROS** we received on June 10 from Tanganyika by way of Germany. Although he had been in the German station for about a year and was well accustomed to people, sudden noises – even the voice of one keeper calling to another – startled him and invariably his tail went up and he whirled to face the supposed danger. Little Joe (a youngster of about four years, weighing 1,240 pounds on arrival) stayed in his stall in the Elephant House for most of his first week with us, despite coaxing by his keeper and offers of food outside his door. In the end, he made up his own mind that the outside world was not dangerous, and ventured out. Now he comes and goes at will and is so well adjusted that he has learned to beg for popcorn over the stone wall.

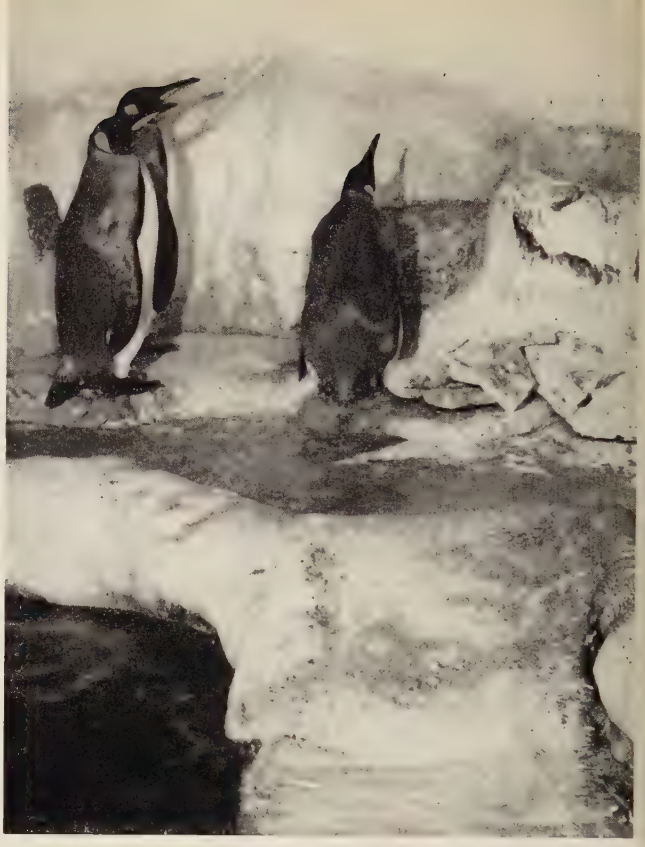


Nine **KING COBRAS** hatched successfully from the thirty viable eggs deposited by our female cobra in her self-made nest on April 24. The first youngster was found outside the egg on the morning of July 4, and others struggled out between then and July 12. Some few eggs simply failed to hatch; in others the snakeling was deformed because of a deficiency of temperature or humidity during incubation – for Curator James A. Oliver had to guess at the optimum conditions for incubation. We are, actually, quite content that the entire "setting" of eggs did not hatch, for the Kings feed on other snakes and it is impossible for us to supply enough young or small snakes to maintain a large number of baby cobras. Up to the end of July the juveniles were sufficiently nourished by the yolk of the eggs from which they emerged, but Dr. Oliver is hoping to induce them to accept dead mice impregnated with snake odor by rubbing with live snakes. The little cobras are strongly marked with white bands on their black bodies, but in a few years these should give way to the uniform olive drab color of the adults. They are fully equipped with venom apparatus on hatching, and several of them – as here – spread their hoods and struck at the photographer while still emerging.

OKA, our female **LOWLAND GORILLA,** a
Apes House, have known each other a gooc
was a timid baby about a year and a half ol
torial Africa in the fall of 1941. By the ti
under the part-time care of Keeper Quinn i
his especial pet and care in the last few years
in the fall of 1950. They have complete c
means that Mickey has never failed to have
in her hand when he passes; at the very leas
a handshake. On Mickey's side, the confid
and Keeper Jim Reilley have played simple
never really struggling for physical mastery
example, it became necessary to recapture
were cleaning her compartment. Mickey k
circumstances, as every good animal man mu
deal of fun together. These photographs w

ber **MICKEY QUINN** of the Great
years. "Doll," as Mickey calls her,
she came to us from French Equa-
was three years old she had come
d Primate House and she has been
ne opening of the Great Apes House
e in each other. On Oka's side, it
(a cherry, a bit of candy) to drop
ways has time for a conversation and
more vital. Since her babyhood he
with her, never pushing her too far,
ation but outwitting her when, for
she might have stolen while they
Oka's probable behavior under most
as a result he and Oka have a great
e one afternoon in July when Oka seemed in the need of amusement. The Park's tree pruners had just brought in a truck load of branches and Mickey abstracted a few. It is part of the game for him to dole them out to Oka grudgingly — to hang on and pretend to tug until Oka wrenches them out of his hands. The afternoon was particularly hot and humid and Oka was restless in the sun, wanting to go back into the comparative coolness of her compartment inside the building, but when the branches appeared she stood her ground until the last one had been yielded to her. Then she dragged and carried her treasures to the bottom of the moat where an open pipe spills a stream of water into the enclosure. By splashing and an inefficient kind of dunking, she managed to wet most of the leaves, and then she hastily dragged them through the open door into the building and onto the ledge where she customarily sleeps. As the last photograph reveals, at the lower right, she made herself a comfortable bed and relaxed. Whether the continuing friendly relationship between gorilla and keeper would have been so strong if Makoko, Oka's male companion from babyhood, had not died in 1951, is perhaps doubtful. Maturing with one of her own kind, it is possible that Oka would have had less need for human companionship. As it is, she and Keeper Quinn have a lot of fun, for Oka is always ready for gentle play.

There are comparatively few animals whose main appeal to visitors to the Zoo is the sheer preposterousness of their appearance; the **GIANT ANTEATER** is one. Perhaps the chief one. If the startling effect needs to be heightened, one has only to come on a Giant Anteater asleep – a formless mound of coarse hair dropped carelessly in the corner – and then wait until the hair is whisked away and becomes a tail, the whole unbelievable animal uncurls and stands up to stretch and delicately yawn. For perfection, wait until the anteater whips out its tongue (see picture on page 100).



seldom happens that two events of major interest and impor-nce are captured in a single photograph, but that is what has ppened here. This scene in the Penguin House shows not only o **EMPEROR PENGUINS,** the first ever exhibited in our collec-on, but a **KING PENGUIN** incubating an egg – again, the first in r history. The two massive Emperors in the foreground (flanked a little Gentoo Penguin) came to us on April 29 through the urtesy of Director William Mann of the National Zoological ark and the Secretary of the Navy. Until laboratory tests re-aled that they were free of the invariably fatal aspergillosis fection, our Emperors were kept in strict seclusion in the "Pen-in Cooler" in the annex to our Aquatic Bird House. On July 10 ey were declared healthy – but in the meantime, one of our four ing Penguins had laid an egg, on June 24, and was incubating on the rock ledge in the Penguin House. (It is the single bird the left of this photograph, standing with its back to the camera; stands with the egg on its feet, covered by a fold of belly skin). lthough we were now at liberty to put the Emperors on exhibi-on in the Penguin House, we hesitated to do so for fear of dis-rbing the incubating King. At that moment fate intervened. uring the hot spell of mid-July, the motor of the Penguin Cool-r's air-conditioning apparatus burned out on a Saturday after-oon, no replacement could be found, and Headkeeper of Birds eorge Scott had to take matters into his own hands and put the mperors in the cool Penguin House, egg or no egg. And it rked out perfectly well – Kings and Emperors were indifferent each other. The King egg should hatch about August 15; ncubation varies between 50 and 55 days. So far the same bird – x unknown – has held the egg, and the keeper feeds it daily.

The attendants' work in our Animal Hospital is often long and hard, but there are compensations: for example, playing with a baby **CONGO POTTO.** Otto the Potto was reared by Nurse Mary Murphy after we learned from previous births that its own parents could not or would not rear it. As Otto gained in size and strength, Attendant Waltz devised an exercise apparatus – a length of rubber hose which he reversed once Otto had climbed almost to the top – an endless game.

How We Photographed

A Rattlesnake's Strike

By HENRY M. LESTER
Photographic Consultant of the New York Zoological Society

EARLY IN AUGUST of last year the Staff Photographer of the New York Zoological Society telephoned me and calmly laid a problem in my lap. Sam Dunton is an old friend and his technical photographic problems are always interesting. *How* interesting, absorbing, difficult and at times heartbreaking neither of us realized at the moment.

For the past two years, Sam said, the Zoological Society had been making motion picture films of an educational nature, in a series devoted to the living reptiles. The latest of these was to deal with the defensive behavior of reptiles, and what the Staff Photographer was asking for was my help in producing ultra-slow motion views of a rattlesnake's strike, preferably in color. Some years ago I had photographed in the Zoological Park the flight of a hummingbird, slowing down to a lazy flapping its 80 wing beats a second. Elsewhere I had made slow motion pictures of the flight of a drone fly performing its feats at about 250 wing beats a second. To show in great detail in slow motion the swift strike of a rattlesnake would be, Sam suggested, an appropriate next step forward. And . . . so it was!

At the time, about all I knew about the strike of a rattlesnake was what I had read in the excellent article Walker Van Riper of the Denver Museum of Natural History had published in ANIMAL KINGDOM earlier in the year ("The Speed of a Rattlesnake's Strike," March-April, 1954). His fascinating report, based on observations, measurements and calculations, gave the total time of the strike as roughly one-quarter of a second. His high-speed photographs were clear illustrations of this action and proved that a strike *could* be recorded – in still photographs, anyway.

And this is "Herman," the tough and aggressive Western Diamondback Rattlesnake that proved to be the perfect subject for high-speed photography. Of all the 20-some-odd snakes tested, "Herman" alone was invariably willing to rear and strike.

High-speed motion picture photography of sudden events, such as a rattlesnake's strike, is considerably more difficult than high-speed still photography because the high-speed movie camera must gather speed before the slim ribbon of film is travelling past the camera's film gate at a rate of 40 to 50 miles an hour – which it does when it is taking pictures at the rate of 2,500 to 3,000 frames per second. Such a "running in" time, while the camera gears are picking up speed, requires from one-half to three-quarters of a second, and after that the camera runs for another three-quarters to one second. Altogether, the high-speed motion picture camera whips through a 100-foot roll of film in about 1¾ seconds. A conventional motion picture camera, were it to run without stopping, would take about four minutes to use up a 100-foot roll of film.

Another complication of such an assignment as Sam Dunton was proposing is that of illumination, of which the high-speed motion picture camera requires a great deal. Taking 2,400 pictures a second calls for an enormous amount of light because each individual picture is exposed for only 1/12,000th of a second. A lot of light usually means a lot of heat, and that is something that a snake could not endure for any length of time. Even if it could survive the light and heat, it would not be likely to be in a mood to strike.

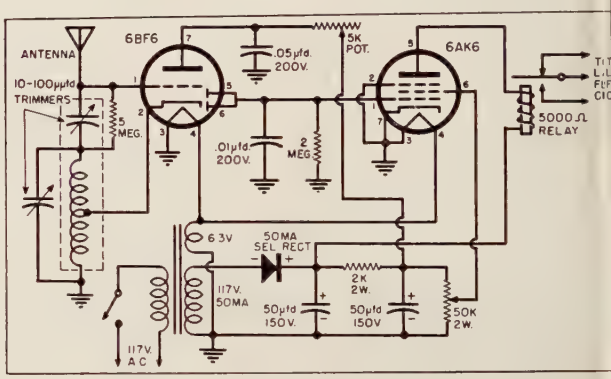
For the illumination problem we had a ready-made solution. Probably not altogether to the liking of the snake, but well within its tolerance. I have for years used a Continuous Flash Lighting outfit which enabled me to get high-speed motion pictures of the hummingbird, the drone fly and other subjects. It consists essentially of two large reflectors, 18 inches in diameter, within which revolve 17 large photoflash lamps that fire consecutively. The two units, flashing

a total of 34 lamps, emit a total of some 3,000,000 lumens of light when their beams are superimposed on the subject. That is many times the light available to us in July and August sunlight. This literally stunning illumination lasts for only one second but, since the useful running time of the camera is only about one second after it reaches peak speed, when camera and lights are synchronized we can expose 65 to 70 feet of film with an abundance of light that would be difficult to get by any other means. To secure comparable illumination with conventional lighting sources would require roughly a thousand of the bright 100-watt household lamps, a powerhouseful of electric current, miles of cables, space-consuming reflectors and auxiliary paraphernalia. The Continuous Flash outfit has the further advantage that it does not radiate much heat on the subject, the heat being largely dissipated as the firing lamps revolve, and the lighting cycle being too brief to impart to the subject more than a passing sensation of warmth.

Ordinarily, synchronizing the flashing of lamps with the run of the camera is a simple procedure. The camera has an actuating mechanism which can be adjusted to start the firing at any point of the passage of film through its gate. But inducing the rattlesnake to strike at some moment during the critical one second when the camera was at full speed and the lights were on . . . there was the rub. The impossibility, we began to think, once we were into the problem. We might as well have been playing Zero on a roulette wheel. Actually, twenty-odd Diamondbacks were flown in from Texas at various times during the course of the experiments, always with the suppliers' promises that these particular specimens were *really* "hot." They may have been "hot" by Texas standards but in the Reptile House laboratory they were merely unpredictable; if they struck, it was either before or after the single second when we were ready to photograph them.

We formed a working team to pool all our skill and ingenuity. It included Dr. James A. Oliver, the Curator of Reptiles; Sam Dunton, the Staff Photographer; Stephen Spencook, the Head Keeper of Reptiles; William Bridges, the Curator of Publications; and myself. For weeks we planned, photographed, confessed failure, schemed and photographed again. Targets for the snake to strike at came and went, and one of the most likely, as we thought, was no more effective than any other. Dr. Oliver offered his own legs as a target — in snake-bite-proof boots and trousers, of course — but all to no avail. Despite Dr. Oliver's assurance that snakes are deaf to air-borne sounds, I insisted on trying amplified audio oscillation, all the way from 20 to 20,000 cycles per second, and all of us had an enjoyable half-hour testing the acuteness of our own hearing. Toscanini is said to be able to hear tones up to 20,000 cycles a second. None of us was a Toscanini — and neither was the snake.

We even tried injecting some of the snakes with a hormone to make them feel that old



springtime aggressive urge. They *did* respond somewhat more actively, but not with the certainty that we needed.

And so, at a plenary session of the working team in November, it was decided to abandon the project, at least for the time being. We had run out of film and flashlamps and we felt that the snakes were tired of playing games. It seemed wise to lay the experiment aside until the spring of 1955.

Looking back, it seems probable that the late season did have something to do with our failures, for rattlesnakes are notoriously more aggressive and willing to strike in the breeding season in the spring. In any event, in March of this year Dr. Oliver received an offer of some guaranteed "hot" snakes from his supplier in Texas. The working team immediately held a conference and a suggestion made by Sam Dunton sent us into immediate action.

Since, Sam reasoned, it was the snake that

made the decision when to strike or not to strike, would it not be better to start the camera, let it reach a speed somewhat slower than 3,000 frames a second in order to extend the useful running time of the film to about 1½ seconds, and let the snake — not the camera's tripping mechanism — actuate the flashlamp circuit?

The obvious advantage of such an arrangement would be that if the snake did not strike during the run of the camera, the lights would not flash — thereby saving us 34 flashlamps worth about $10 — and the film would not be exposed in the prevailing working light, another $10 economy.

This seemed to be a capital idea. We immediately reassembled the photographic equipment (about half a ton of it!) and set it up in the mezzanine laboratory of the Reptile House where, under ideal conditions, we had previously worked. Sam's scheme meant that additional equipment would have to be devised to put it into effect. At first we considered using the rather conventional "electric eye" beam of light — the device that is familiar to many of us as it opens the doors at the Pennsylvania Station — and to set it so that an interruption by the snake's body would actuate the flash circuit. That idea we abandoned when we realized that too often the hand-operated target would cut into the beam and set off the lights. Instead, we decided on what is called a sensitive capacitance relay. This is in fact nothing but a very tiny broadcasting transmitter (to put it in familiar terms) with a sharply delineated zone of sensitivity. The snake's head, upon entering this zone, causes an electrical disturbance which is instantly relayed to a fast-acting electric switch that closes the flashlamp circuit. A manual adjustment was built into this device so that the sensitivity could be individually adjusted for each snake in its pre-striking position.

Many trials and errors later we embarked on a new series of attempts with a working setup

This electronic "brain" was finally devised by Mr. Lester to make the rattlesnake itself set off the flashlamps used in high-speed photography. It saved scores of flashlamps.

A strike. Dr. Oliver grimaces in the glare of the lights and at the right Mr. Lester operates controls of the camera, through which film is rolling at 40 miles an hour.

1

2

5

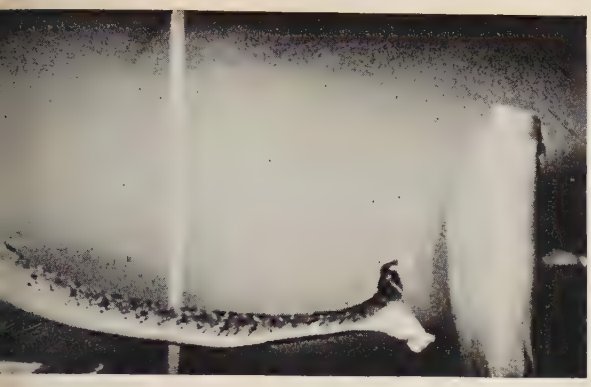
6

Individual scenes from the motion picture taken at a hundred times normal speed. Scenes 1 to 4 show the snake's head approaching the sponge rubber target; Scene 5 is the stabbing bite, and the remainder of the series show the snake returning to its coiled position of attack.

that promised a flash immediately when the snake plunged forward from its coiled position. This was the closest we could get, we felt, to the workings of the snake's brain; *our* minds had proved incapable of anticipating the snake and its decision to strike; now electronics were to tell us when the snake made up its mind. Actually we trailed the snake's decision to strike by only a few thousandths of a second.

The snake was given a movable wooden plat form about 15 by 18 inches, covered with a copper screen connected by a thin, flexible, insulated conductor to the "ground" – the chassis of the "transmitter." The platform was on gliders and could be moved freely anywhere upon the 6-foot by 4-foot table which was our photographic stage. The technically-minded readers of this report may be interested in the circuit of the capacitance relay shown here. It is, actually, not as complicated as it looks, and embodies well-known principles. Its "antenna" terminated in another area of copper screen stapled to the table in front of the snake's platform, and this was adjusted by trial and error to give a maximum response to the fairly small capacitance of a snake. The device could be made so sensitive that the relay was tripped by the time the swiftly-striking snake's head had penetrated the field for only about two inches.

Our next problem turned out to be the target. The one we prepared originally was a beauty – to us, but not to the snakes. That elaborately prepared device of foam rubber and leather looked pretty in test pictures and had the practical value of enabling us to present it either vertically or horizontally, giving Dr. Oliver a chance to secure evidence on a moot point: when a rattlesnake strikes, does it stab, or bite, or both? The snakes would have nothing to do with the target which suited our needs. What they really



4

8

went for was a mere piece of brown cardboard, the side of one of the flashlamp cartons. At this they would strike viciously on sight, even when it was beyond their reach. We promptly threw away the glamorized target, covered a part of the carton's side with foam rubber and a much larger piece of leather so that the snake had a target worthy of its ire, and our subjects struck at it every time it was presented.

The setup, its electrical, mechanical and human components, was tried and tested. We had to learn how to handle the target: just *so,* not too much motion and not too little. We had to study the snakes to learn something about their individual behavior, "reach" and the level of their strikes. Two of a batch of six Western Diamondback Rattlesnakes from Texas were "hot" enough to suit us and of these, one nicknamed "Herman" was all that the heart could desire. Herman had only one thought in life and that was to sink his fangs into any moving object that came within reach. That made it slightly easier for us to synchronize the functional relationship of man, animal and a lot of machinery so that they all converged upon one fraction of a single second.

Proof that we were synchronizing our efforts had to be gained by photographic means, since the snake's strike seen by the human eye in the blaze of intense light cannot be judged accurately. We mounted a Polaroid film back on a Speed Graphic camera and presented the target. The snake struck, the lights went on, and a minute later we pulled the finished print, which showed us what our high-speed camera would have seen had it been running. Some of the best of the Polaroid test photographs were just what we wanted but the great majority of them were not satisfactory; some showed that the snake had tripped the mechanism too soon, some too late. Each time minute corrections and adjustments had to be made.

The work was fascinating and absorbing, but slow at best, for our snakes could not be made to rehearse indefinitely. They were obviously tired after four to six strikes and we would have to call it a day. Two or three days later they would be full of energy and strike willingly once more. Here, again, we learned something; al-

though the lights went on and the film rolled, the third, fourth and successively later strikes of even a well-rested snake were frequently shams; we saw the rattler shoot out toward the target, open his jaws partly and then, as if he changed his mind, close them and continue onward only to bump the target with his nose. In other "takes" on the motion picture film we saw the snake strike without ever opening his jaws, and even hit the target with the side of his head. It is possible that some of these ineffective strikes were the result of the blinding and confusing flash of light. But since most of them occurred late in the course of a day's experiments, fatigue probably had much to do with it. Sometimes the target was missed altogether, but this would likely be caused by the light.

And then came THE strike, the one and only complete strike fully recorded by the high-speed motion picture camera, in color, so far as we know. It came on April 1, shortly before noon.

Our subject was our favorite actor, Herman, and we had pre-tested him with the Polaroid camera at the beginning of the day's work. It was nicely centered, Herman broke the electronic field early in the picture, and when we saw it we knew that we were ready. Oddly enough, I think all of us had a feeling that this time we were going to get the picture, for Herman was so obviously tense and ready for anything.

The camera was sighted once more, loaded, the flashlamps given a final precautionary twist in their sockets, the electronic equipment was checked and then checked again, the way one does under nervous tension. Herman reacted to our movements, rising on his coils and holding his head in the menacing S-loop that meant business. Dr. Oliver coolly presented the target, jabbing it forward and pulling it back in the jerky, erratic fashion that we knew worked well with Herman. For perhaps ten seconds he feinted and when he sensed that one more approach of the target would unleash Herman's fury he shouted "Now!" and the moment we had been working for was upon us. I pressed the switch that set the camera in motion and its whirring rose to a shrill whine as the film gathered speed — 20, 30, 40 miles an hour acceleration from a dead start. Close beside the camera I alone heard the sharp click of the relay and then there was a brilliant burst of light as the first flashlamps fired. The glare was too intense for full observation but from my position directly at the side of the snake I could see a gray-brown streak dart forward and the great jaws open a full 180 degrees. Dr. Oliver was more completely blinded than I and saw nothing, but he felt the full impact of the strike on the target and the solidity of the jolt told him that it was a strike squarely in the middle.

In a single second it was all over, the last flashlamps exploding and showering us with sparks . . . the comparative blackness that follows great illumination . . . and all was quiet again and Herman was back where we last had seen him, on the platform, coiled and ready for the next encounter.

Although we tried many times in the days that followed to get other aspects of the strike, the one that was recorded on April 1 turned out to be the only good and complete record obtained during all those weeks of heartbreaking — and sometimes backbreaking — efforts and frustrations. The other views were interesting but incomplete actions, usable only as supplementary or explanatory material.

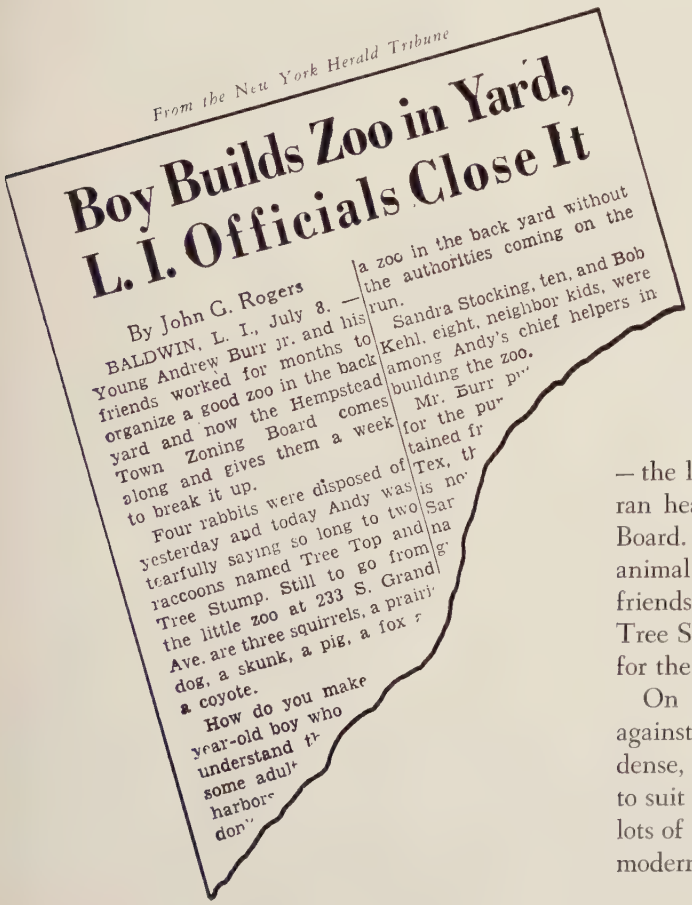
Our usable film was photographed at 2,400 to 2,500 frames per second, and all in color. All the footage was accurately timed for study and measurement. Motion pictures taken at 2,400 frames (individual pictures) per second produce a "time magnification" of the action of 100 times, when projected at the normal speed of 24 frames per second. In other words, when viewed on the screen, the movement of the snake appears slowed down to one one-hundredth of its actual speed. If Dr. Van Riper's calculation of the average speed of a rattlesnake's head during its strike — 8.1 feet a second — is close to the rate at which our Herman struck, he will be seen on the screen lashing out ferociously at the leisurely pace of about one inch per second.

To sum it all up: the total usable footage secured by us in recording the strike of the rattlesnake came to about 100 feet of color film. To accomplish this much, required the skills and technical knowledge and ingenuity of five men over a period of seven months — to say nothing of the services of carpenters, electricians, mechanics and assistant keepers, who became as

excited as the rest of us when we seemed on the verge of success, and exercised their own ingenuity in making whatever "gadgets" we required. Twenty some-odd Western Diamondback Rattlesnakes were flown up from Texas for the experiments. Six thousand feet of Kodachrome film were shot through the high-speed camera, rushed by messenger to the processing laboratory, sped back a few hours later for eager viewing by eyes that lost some of their glee as the wastebaskets began to overflow with discarded film. Some 3,000 flashlamps were fired, in lots of 34 for each exposure. A whole benchful of auxiliary equipment had to be built, tried, discarded and replaced by new electrical and electronic devices . . . but it was worth the effort, for we got what we wanted.

Some of the special problems required specialized knowledge, and when we came to these points we received the wholehearted cooperation of the Eastman Kodak Company of Rochester, N. Y., and the Lamp Division of the General Electric Company of Nela Park, Cleveland. For the benefit of anyone else who wants to tackle this problem, it should be recorded that the flashlamps used in the Continuous Flash Lighting equipment were G.E.'s #31 Focal Plane Flash Lamps. The Kodak High-Speed Motion Picture Camera, Type III, was used throughout. It was equipped with the Kodak Cine Ektar, 25mm f/1.9 lens which, for the benefit of the photographically-minded, exposed the Kodachrome footage at f/4.5. For an operating speed of 2,400 to 2,500 frames per second, each individual frame was exposed to the light and the action of the snake for about 1/12,000th of a second.

Precision machinery and electronics are reliable tools. But, knowing rattlesnakes as intimately as I have come to do in the past few months, it still seems astonishing and exciting to me that we were able, if only once, to bring men and machines and snake into harmony in that critical split second.



From the New York Herald Tribune

Boy Builds Zoo in Yard, L. I. Officials Close It

By John G. Rogers

BALDWIN, L. I., July 8. — Young Andrew Burr jr. and his friends worked for months to organize a good zoo in the back yard and now the Hempstead Town Zoning Board comes along and gives them a week to break it up.

Four rabbits were disposed of yesterday and today Andy was tearfully saying so long to two raccoons named Tree Top and Tree Stump. Still to go from the little zoo at 233 S. Grand Ave. are three squirrels, a prairie dog, a skunk, a pig, a fox and a coyote.

How do you make a zoo in the back yard without the authorities coming on the run.

Sandra Stocking, ten, and Bob Kehl, eight, neighbor kids, were among Andy's chief helpers in building the zoo.

Mr. Burr p... for the pu... tained fr... Tex, th... is no... Sar... na... g...

How do you make a year-old boy who understand t... some adul... harbor... don...

We're Sorry for Andrew Burr, Jr.

— the little boy out in Baldwin, L. I., whose zoo ran head on into the Hempstead Town Zoning Board. We're sorry for every thwarted young animal lover who has to bid farewell to such friends as Tex, the coyote, and Tree Top and Tree Stump, the raccoons. These are hard times for the city child who loves pets.

On the other hand, it is difficult to argue against town ordinances with people piling up in dense, tense communities. Rules have to be made to suit the average. So back-yard zoos must go as lots of other things have been sacrificed to fit our modern ways of living. The neighbors can play

the piano all night but the sunset song of the coyote is OUT.

* * *

The next best thing for a boy like Andy Burr is to become acquainted with the New York Zoological Society. At the Bronx Zoo and the new Aquarium the Andys of these times can have animal friends – not exactly their own, but pretty nearly!

Have you ever visited the zoo with one of our younger members? There's a sense of proprietorship in the zoo which comes from Society membership that has its own special glow in the eyes of youth. If your boy is grieving for the lack of a pet see if he won't get a thrill – quite a big thrill – by allying himself with one of the best collections of pets on earth.

New Members of the New York Zoological Society

(Between May 1 and June 30, 1955)

Fellow

Dr. Theodore Kazimiroff

Founder in Perpetuity

Saul Blickman

Life

Mrs. Cornelius R. Agnew
Mrs. Harry Payne Bingham
Mrs. Eleanor Rixson Cannon
John N. Irwin, II
Mrs. Katharine Maynard
Henry Sears
J. Spencer Weed

Contributing

Walter C. Bennett
Louis Britwitz
Louis S. Cates
Jarvis Cromwell
David C. Eaton
Phanor J. Eder
Dr. George F. Egan
Mrs. Osborn Elliott
Howard M. Ernst
Morton H. Fry
Master Thomas F. Garner Jr.
W. French Githens
Miss Marjorie Hillas
Allen S. Hubbard
Mrs. Kenneth Kopelson
Henry G. Leach
Mrs. Huntington McLane
Mrs. E. W. Miles
Com. Morton J. Newburger
Robert Noerr
Mrs. Andrew Oliver
Miss Katharine Ordway
Mrs. Frederick Osborn
Hugh E. Paine
Mrs. Conrad M. Riley
Mrs. B. Ruml
Dean Rusk
Max Y. Seaton
Mrs. David A. Schulte
C. Francis Smithers
Mrs. Read Taylor
William A. Ten Eick
R. E. Tomlinson
Dr. Edwin C. Van Valey
Paul Felix Warburg
Frank Weil
Mrs. Davenport West

Annual

A. Gifford Agnew
Howard Bayne
M. Gould Beard
Mrs. Amory H. Bradford
Miss Florence Briscoe
Ernest Brooks, Jr.
Melville H. Cane
G. Wyman Carroll
Mrs. John C. Crawley
Miss Mary H. Dana
Albert P. Delacorte
John C. Doughty
Hon. David N. Edelstein
Miss Lita Eliscu
Arthur H. Elkind
George Farber
Fred Ferber
Irving Fishman
Samuel L. Fuller
John S. Gallick
Milton S. Geist
Gardner F. Gillespie, Jr.
Rodney C. Gott
Mrs. Francis J. S. Grace
Harold Halliday
Raymond Hochmuth
Mrs. Paul Hoffmann
Mrs. Marianne Holland
Miss Natalie Hollerith
Mrs. James H. Hunter
Mrs. Edward Immerblum
William E. Jackson
M. C. Kaplan
Edward Klauck
Mrs. Charles L. Lawrance
Lawrence Litchfield, III
Mrs. G. Barron Mallory
Harold C. Mayer
Mrs. Eric M. Maynard
Mrs. J. Arrison McCurdy, II
Mrs. Samuel W. Meek
Albert H. Merkel
Mrs. Stanley G. Mortimer, Jr.
Matthew J. Murray
Mrs. Julian S. Myrick
Mrs. Ilse Nast
Mrs. Cheever Porter
Miss Evelyn A. Post
George R. Puckhafer
Dr. F. K. Reid
Mrs. Marjorie Reilly
Mrs. Phyllis M. Ricci
Jacob Robinsohn
Stephen Rosenbaum
B. Schmones
Harvey L. Schwamm
Mrs. F. J. Starzel
Hokan B. Steffanson
Miss Viola G. Stevens
John Storck
Herbert Bayard Swope
Richard Wagner
Louis E. Walker
Miss Grace E. Wallin
Saul Warshaw
Mrs. Edward M. Weld

News from the Conservation Foundation

Changing the Face of the Earth

Dr. Osborn and Mr. Ordway attended the six-day International Conference held at Princeton under the auspices of the Wenner-Gren Foundation on the subject of "What Man Has Done and Is Doing to Change the Face of the Earth." This meeting was attended by eighty selected individuals from seventeen nations and included anthropologists, economists and land-use planners, biologists, hydrologists, oceanographers and other technicians concerned with the life sciences.

Pan American Institute

The Foundation will be represented at the Conference of the Pan American Institute of Geography in Mexico City this month by Dr. Enrique Beltran, one of the leading conservationists in Latin America, who has been associated with the Foundation's work in the study of soil erosion and population problems.

Radio and Television Programs

A thirteen-week radio program reviewing conservation activities and achievements in the United States has been arranged in cooperation with the National Broadcasting Company's Educational Division and is expected to be on the air this fall. In addition, a number of the Foundation's educational films will be incorporated in a new television program to be broadcast from various educational television stations throughout the country.

Jamaica Studies

Mr. George W. Roberts' book on population trends in Jamaica, which resulted from his study sponsored last year by the Foundation, is to be published by the Cambridge University Press this year. Mr. Peter Stern of the Foundation staff has returned to Jamaica temporarily, to complete his study of geographic and economic phases of the population-resource problem in that island.

Dr. Max Nicholson Visits the U. S.

Dr. Max Nicholson, Director-General of the British Nature Conservancy, visited the United States in June at the invitation of the Zoological Society, the Conservation Foundation, the Wildlife Management Institute and the American Committee for International Wildlife Protection. After attending introductory dinners in New York and Washington, Dr. Nicholson visited a number of national parks and forests, wildlife refuges, governmental research stations and state and local watershed developments and reserves.

The I.U.P.N. Atlas

Dr. Osborn has been invited to write the foreword to the World Atlas of Parks and Wildlife Reservations to be published shortly by the International Union for the Protection of Nature. He has also been invited to write a chapter dealing with natural resources and population problems for a new symposium on conservation to be published by the Natural Resources Council of America.

Water Law Survey

The survey, now in progress, of the nature of the growing water problems of the Eastern States is receiving enthusiastic cooperation from federal and state administrators and legislators. The Council of State Governments and state Chambers of Commerce have offered full assistance. Professor David Haber of the Yale Law School, Professor Charles Harr of the Harvard Law School and Professor Richard Arens of the Buffalo Law School are engaged in the study of legal changes which will be needed to enable the East to meet effectively the increasing competition for the limited supplies of water available for domestic, municipal and industrial use as well as for agricultural irrigation. It is expected that this survey will be completed early next year.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Fairfield Osborn and John Tee-Van Receive Honorary Degrees

President Osborn and Director Tee-Van were awarded the degree of Doctor of Science *honoris causa* by New York University and Rensselaer Polytechnic Institute, respectively, in June. Of Dr. Osborn the citation read:

Fairfield Osborn, an irredeemable Princetonian, the son of a famous paleontologist, was swaddled in academic sheepskin on the campus and weaned on the baccalaureate in 1909. An overseas Captain of Field Artillery in World War I, he quit the rolling caissons for the ravenous coffers of Wall Street, and until 1935 was immersed in the investment business. It was then that the home-grown propensity for natural science turned his career irrevocably in that direction. In 1940 he assumed the mantle of the presidency of the New York Zoological Society once worn by his father, its founder. Eight years later he added to this the presidency of the Conservation Foundation. Leading world figure in the crucial effort to arrest the headlong dissipation of the earth's natural resources, and author of key treatises of the utmost significance on the subject, devoting his life unselfishly and unsparingly to a vast educational effort toward protection against prodigal waste of mankind's basic patrimony, he is every inch a conservationist – and there are a good many inches – and we gladly present him for the doctorate of Science.

Dr. Tee-Van was cited for the doctorate of Science in the following terms:

Rensselaer Polytechnic Institute confers the honorary degree of doctor of science upon John Tee-Van in recognition of his achievements as a zoologist. Born in Brooklyn, in 1916 he became an assistant in the New York Zoological Society, working under the famous William Beebe, director of its Department of Tropical Research. Since then he has participated with outstanding distinction in scientific expeditions conducted by the Society in various parts of the world, and his steadfast pursuit of research has brought forth important contributions to the zoological sciences, particularly in marine biology.

His increasing stature in the world of science over the years resulted in successive promotions by the Society. In 1952 he was selected as director of the New York Zoological Park, having charge of the New York Zoo and its scientific laboratories in the Bronx, the New York Aquarium, and other installations administered by the Society.

Although he never had the advantage of a formal college education, his attainments are generally recognized as of the highest scholarly order. His definitive encyclopedia on marine biology promises to be a standard reference work for generations. His natural aptitudes, general ability, and self-taught scientific training more than compensate for any lack of collegiate associations. Numerous learned societies have honored him, including the New York Academy of Sciences, which elected him its president.

The Things People Wonder About!

Fifteen to twenty thousand questions are asked – and answered – in our Question House each year, all reflecting some gap in the public's knowledge of animal life. Some recent *lacunae* we have tried to fill –

What is the bird that alights on people and eats them up?

Does the Electric Eel see when he lights up?

Do Lions snore?

When a duck bites you, do the teeth hurt?

Is it true that the Platypus is the only bird that's a mammal?

THE MORNING'S MAIL

The Reptile Club

Sirs –

I received the Annual Report of the New York Zoological Society. While I was reading it I saw the chapter on the Reptile Department which I found very interesting.

In it I saw that you had started a Reptile Club for a group of young herpetologists. But what I would like to know, is it just for college students who intend to make it their life's work? Or can anyone who is interested in Reptiles join the club?

George L. Meyer
Closter, New Jersey

Reply by Dr. James A. Oliver, Curator of Reptiles:

We do have a Reptile Club here at the Zoological Park for youngsters of all ages. We have discontinued our meetings for the summer months, but plan to start again in the fall. We will hold our first meeting on Saturday morning, September 24, at 10:30 A.M. in the Reptile House. If you would like to join the group, we will be very glad to have you there at that meeting, and I am sure you would find congenial members of your own age present.

FOSTER FATHER

Headkeeper Scott and feathered friend

From May until mid-August our Bird House takes on some aspects of a multiple nest, with fledgling birds of a dozen species quartered in every room. Young birds that have fallen from the nest, or been rescued from cats, begin to arrive soon after the nesting season starts and although they often tax the time and housing facilities of the department, they are never turned away.

A fledgling Kingbird was brought to the Bird House in June, the first of its kind we have had. The commonest temporary boarders are Robins, Starlings, Grackles, Bluejays and Sparrows, with a sprinkling of Flickers, Kildeer, Bobwhite Quail, Phoebes, Bobolinks and Cardinals.

Since many of the birds have to be fed at intervals of fifteen to twenty minutes when they first arrive, the chore of taking care of them is considerable. Occasional specimens are kept for the collection of native birds, but most of them are liberated after a trial period in the "Dome Cage" outside the Bird House, to make sure they know how to find food by themselves.

Congolese Fishes Come to the Aquarium

The fish fauna of the Congo River is one of the richest in the world; only the Amazon has a greater variety. Nevertheless, fishes from the Congo are rare in American aquariums, principally because no commercial collectors regularly operate in the Belgian Congo and because there is no direct air transportation between west Africa and North America. The Aquarium was therefore especially pleased to obtain Congolese fishes from two different sources this summer.

From the Société Royale de Zoologie d'Anvers, through the offices of Director Walter Van den bergh, we received freshwater puffers, two kinds of upside-down catfishes, snakeheads, One-spotted Climbing Perch, Feather-tails and a Dollo's Lungfish. From one of the rare commercial shipments originating in the Belgian Congo we purchased additional Feather-tails, two small *Polypterus* and two *Alestes longipinnis.*

Although small in number, the new fishes are high in exhibit value. Because of their grace and color, the *Alestes* and Feather-tails are particularly attractive. The puffers are capable of blowing themselves up like golf balls. The *Polypterus* have tufts of feathery gills on either side of the head. Such external gills are common among salamanders, but the only fishes that exhibit them are *Polypterus* and lungfish when they are young. — J.W.A.

IN BRIEF

Champion Chimpanzee. In 1945 we purchased a magnificent Black-faced Chimpanzee from the St. Louis Zoological Garden. "Jimmy," as he was called, was then twelve years old and had grown a little too large, old and uncertain of temper to continue his act in the St. Louis Zoo exhibition of trained animals — he had been accustomed,

the story goes, to ride a bicycle while smoking a cigar. As an exhibition animal, with no performances required of him, Jimmy has been superb. We realized that he was of imposing size, but hardly knew how imposing until he was weighed on June 3, and found to weigh 190 pounds. This is, so far as we can discover, a record weight for the species.

A Pair of Cheetahs. Two magnificent young Cheetahs, hand-reared, have been placed on exhibition in the Lion House. We have not exhibited Cheetahs since 1940 and the pair is therefore especially welcome. Gentle and well-adjusted as these animals usually are, they do not appear to have bred in captivity in any zoological collection. There has been much speculation about how fast they can run. Estimated speeds go up to 70 miles an hour, but the best clocked record (on a dog track by a noted scientist) is only 44 miles an hour.

Busy Miss McCrane. For a number of years our Education Department has offered the services of a member of its staff to public and private schools, to give talks and exhibit a number of small animals. Requests for the talks far outrun the ability of the department to keep up with them. In one month in late spring Miss Marion McCrane of the department gave 45 talks to a total of 4,530 school children.

PUBLICATIONS OF INTEREST

THE SAGA OF THE GREY SEAL. By R. M. Lockley. Illus. 13 photographs in black and white, numerous line drawings and two maps. Pp. vii + 149. The Devin-Adair Co., N. Y., 1955. $4.00.

Originally published in Great Britain under the title "The Seals and the Curragh," this book is an altogether fascinating yet completely factual account of a breeding season during which the author lived in close contact with seals on the coast of Wales. Mr. Lockley has acquired an enviable reputation for the charm and accuracy of his nature reporting. The present volume is well in accord with the expectation engendered by its predecessors. — L.S.C.

EVOLUTION OF THE VERTEBRATES. By Edwin H. Colbert. Illustrated by Lois Darling. Pp. xiv + 479. John Wiley & Sons, Inc., New York, 1955. $8.95.

Dr. Edwin H. Colbert records here "a history of the backboned animals through time." His account is presented in scholarly fashion, but in language that the layman will readily comprehend. The illustrations greatly enhance the text and include several novel methods of presentation that add to their clarity. The book will serve as an excellent elementary text or handy reference for all who are interested in the story of the backboned animals and their evolutionary history. — J.A.O.

STRAY FEATHERS FROM A BIRD MAN'S DESK. By Austin L. Rand. Chapter-head cartoons by Ruth Johnson. Pp. 224. Doubleday & Co., Inc., Garden City, N. Y., 1955. $3.75.

Primarily a systematist, as indicated by his position of Curator of Birds at the Chicago Natural History Museum, Dr. Rand's secondary devotion has always been to the living bird and its behavior. In sixty brief, unrelated chapters, he has recorded a great variety of observations on the ways of birds. Most of them are his own but when the work of others is drawn upon, credit is given in a list of references. Miss Johnson's amusing drawings and some of the chapter titles suggest a lightness of treatment that is not borne out by the text. While the author has used a readable and engaging style, fact and conclusion are as sound throughout as is to be expected of a scientist of his standing and experience. — L.S.C.

THE BAFUT BEAGLES. By Gerald M. Durrell. 22 illustrations in black and white from drawings by Ralph Thompson. 238 pp. The Viking Press, New York, 1954. $3.75.

THE ODYSSEY OF AN ANIMAL COLLECTOR. By Cecil S. Webb. Fifty-one illustrations in black and white from photographs and ten from drawings by L. R. Brightwell and W. C. Osman-Hill. Introduction by Geoffrey Vevers. Longmans, Green & Co., New York, London and Toronto, 1954. 368 pp. $6.50.

Seldom indeed do two books concerned with the collecting of living zoological specimens arrive simultaneously on one's desk. But had they been separated in time by a span of years, their style and content could not have been more different.

The title of Mr. Durrell's book forecasts the treatment, for his "beagles" are a team of native hunters, not a pack of the popular little hounds. It should be said at once that Mr. Durrell writes extremely well, an ability that will fascinate the casual reader as it invariably has the literary reviewer. The first nine chapters have to do largely with the chief, known as the Fon, of the district of Bafut, in the Cameroons of West Africa. A scattering of descriptions of local field trips serves as a foil for the doings of the Fon but leaves the nature-minded reader with a vague feeling of frustration. There is compensation, however, in the final three chapters, when the Fon has been left behind and the author is free to deal with matters more directly related to his project. The chapter called "The Forest of Flying Mice" outweighs even the Fon himself in interest.

Mr. Webb's book, originally published in England as "A Wanderer in the Wind," is an entirely different matter. It is a straightforward, factual account of the experiences of a man who, now settled down as Superintendent of Dublin's famous Zoo, still ranks with Goodfellow, Fred Shaw Mayer and Charles Cordier as one of the world's most expert zoological collectors. During the long years when one expedition followed another, Mr. Webb sought his treasures in many parts of Africa and in India, Indo-China, South America and Australia. The outbreak of World War II found him in Madagascar and held him there for six years. General "literary" reviewers will not be as favorably impressed by Mr. Webb's writing style as by Mr. Durrell's, but it is equally certain that the zoologically inclined will find more solid satisfaction in "The Odyssey of an Animal Collector." — L.S.C.